

Digital Voice update 2016

Alex VK2PSF

Waverley Amateur Radio Society

<http://vk2bv.org/faq>

Many of the specifications are Open!!

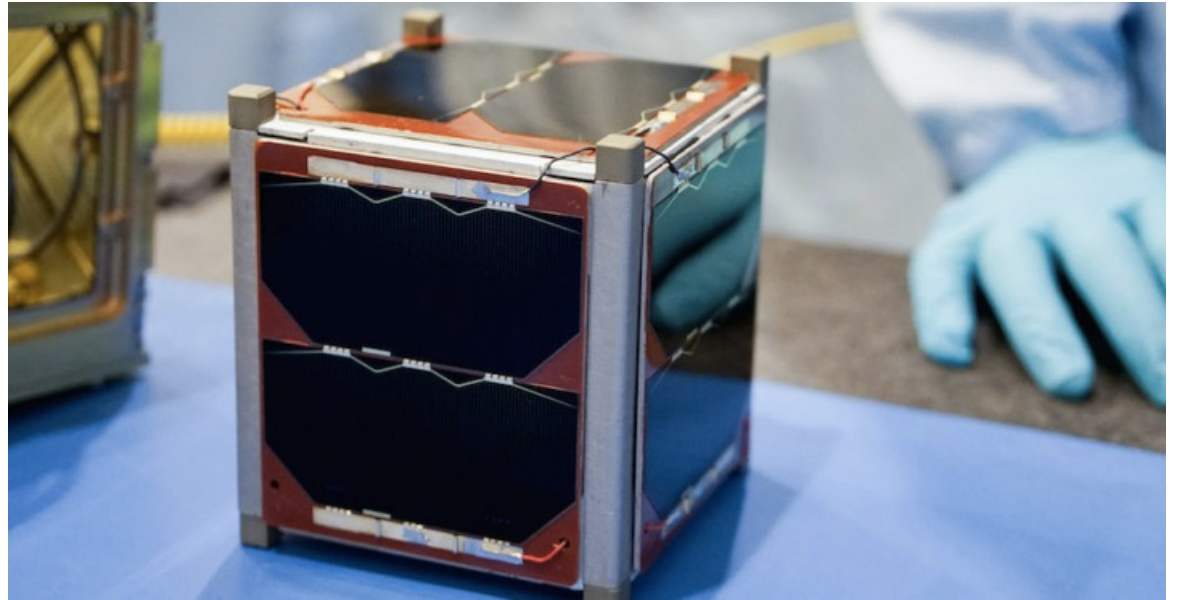
- P25 – Project 25 initiated in 1988 – Phase 2 spec closed in 2004
- DStar – JARL Published Specification 2001 – Revised 2004 and in 2014
- DMR – ETSI Standard Tiers 1 and 2 in 2005, Tier 3 2012.
- dPMR – ETSI (2006/7) [lower functionality, lower Infrastructure]
- Nxdn – 2005 [Icom – IDAS, Kenwood – NEXEDGE]
- C4FM- Yaesu – 2012 direct evolution of P25 Phase 1
- ...
- FreeDV – Uses Codec 2 (based on Thesis in 1997) 2011- from David Rowe

D-Star Update

- Updated version of specification (V5.0) was published in 2014 which included a new data mode (using the whole packet for Data in a “voice link”) 4800bps (inserts data in the voice packet)
 - This is not the same as the original DD links (128kbps) in the 23cm ID-1
 - Only works between newer radios.
 - Not much success with 3rd party extract (like DPRS)
- CCS scheme replaced by CCS7
 - Uses same number and registration as DMR-MARC system
 - Allows point– point connection of Dstar “repeaters” based on last heard location (within the ircddb network)
 - (Hopefully online on VK2RBV in August)
- D-Star HF Net

D-Star Update

- D-Star Satellite Payload
 - OUFTI-1 Orbital Utility For Telecommunication Innovation
 - University of Liege – Belgium
 - Launched 25 April 16 and worked immediately
 - Unfortunately went silent 7 May 16
 - Didn't get to boot D-Star mode



P25

- Not much to add here....
 - DMR seems to have clearly taken over.
 - Further standards development has been shelved.

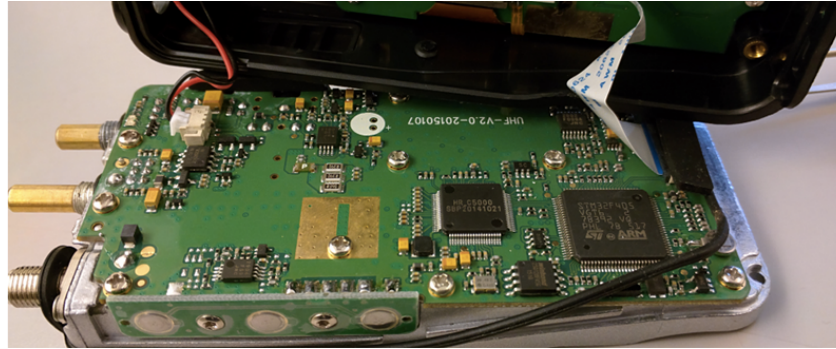
DMR

- Tier I 0.5 Watt 446 MHz FDMA Device license
- Tier II 66-960MHz 2 slot TDMA in 12.5kHz
- 2005 MOU between manufacturers, selected AMBE for Vocoder (not part of spec).
- “Interoperability” very “qualified” and not encouraged.

	Standard No.	Standard title.
Interoperability Certificates and Summary Test Result download.		
June 2012 Tait and Hytera Tier III Certificate	TS 102 361-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol
June 2012 Tait and Hytera Tier III Summary Test Result	TS 102 361-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 2: DMR voice and generic services and facilities
Sept. 2011 SELEX Elsag and Vertex Standard Certificate	TS 102 658	Digital Private Mobile Radio (dPMR) using FDMA with a channel spacing of 6,25 kHz
Sept. 2011 SELEX Elsag and Vertex Standard Summary	TS 102 658	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Private Mobile Radio (dPMR) using FDMA with a channel spacing of 6,25 kHz
Sept. 2011 Vertex Standard and Motorola Solution	TS 102 490	Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW
April-2011 Radio Activity and Hytera Certificate	TS 103 236	Electromagnetic compatibility and Radio spectrum Matters (ERM); Continuous Tone Controlled Signalling System (CTCSS) and Digitally Coded Squelch Signalling (DCSS) system
April-2011 Radio Activity and Hytera Summary Test	TS 102 361-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol
March-2011 SELEX Communications and Hytera Certificate	TS 102 361-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 2: DMR voice and generic services and facilities
March-2011 SELEX Communications and Hytera Summary	TS 102 361-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 3: DMR data protocol
July-2010 Motorola and Radio Activity Certificate	TS 102 361-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol
July-2010 Motorola and Radio Activity Summary Test	TS 102 490	Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW
May-2010 Motorola and SELEX Communications Certificate	TR 102 884	Electromagnetic compatibility and Radio spectrum Matters (ERM); digital Private Mobile Radio (dPMR) General System Design
May-2010 Motorola and SELEX Communications Summary	TS 102 658	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Private Mobile Radio (dPMR) using FDMA with a channel spacing of 6,25 kHz
	TR 102 398	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) General System Design
	TS 102 361-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol
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	TR 102 884	Electromagnetic compatibility and Radio spectrum Matters (ERM); digital Private Mobile Radio (dPMR) General System Design
	TR 102 398	Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) General System Design
	EN 301 166-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrow band channels and having an antenna connector; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive
	TS 102 490	Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW

DMR

- The “\$100” Radio
 - MD380
- Shmoocon – hacking the MD-380
 - Travis Goodspeed
 - Reverse engineered the firmware
 - Override privacy bit and TG filter.



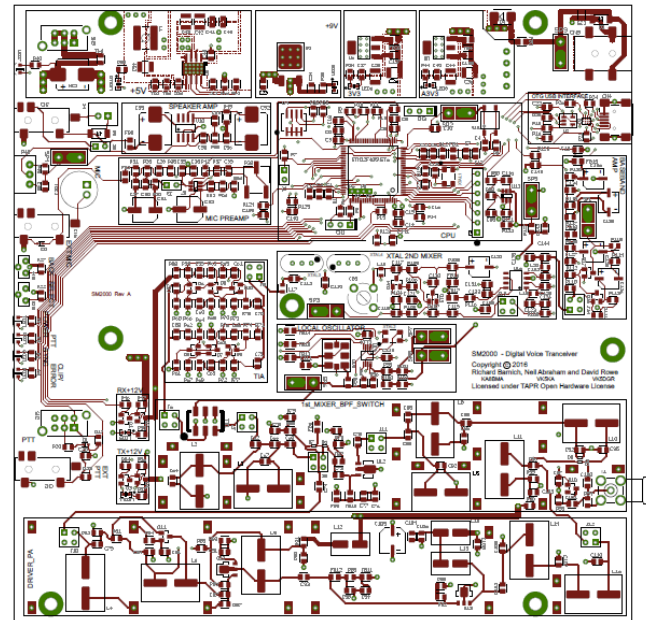
- Same hardware/firmware for several radios
- CPS hacks and rewrites
- The supplied software is very simplistic – excellent – easy to write scripted UI moves to load data!!

Yaesu - Fusion

- C4FM based on P25 with several functions derived from Motorola (During The Yaesu-Vertex-Motorola Phase)
- “Open Specification” published by Yaesu Musen 2013
 - Basic Mode DN was quickly taken up and deployed in 3rd party projects (DV4mini)
 - VW and DW still not stable. - suspect some extra undocumented detail.
- Aggressive repeater role out and equipment pricing
- Wires-X (Internet link/reflectors) still relatively closed

FreeDV - Codec2

- SM1000 released
 - Connect to SSB radio and power
 - (includes mic/spkr)
- SM2000 VHF radio



L1-SM2000-A-503-A

Speeds and Feeds....

	Channels	BW kHz	Mod	Vocoder	Vend	
DStar	1	6.25	FDMA	AMBE+	Icom (Kenwood), Ham Community	
Fusion	1	12.5	FDMA	AMBE 2+	Yaesu	
P25	1	12.5	FDMA	IMBE	Several	
DMR	2	12.5	TDMA	AMBE 2+	Several	
NXDN	1	6.25/12.5	FDMA	AMBE 2+	Icom/Kenwood	
Free DV	1	1.25	FDMA	Codec 2	Ham Community	

“DV modes are 95% the same and 100% incompatible” –
John Hays, K7VE

D-Star Network and reflectors

D-Plus Robin AA4RC

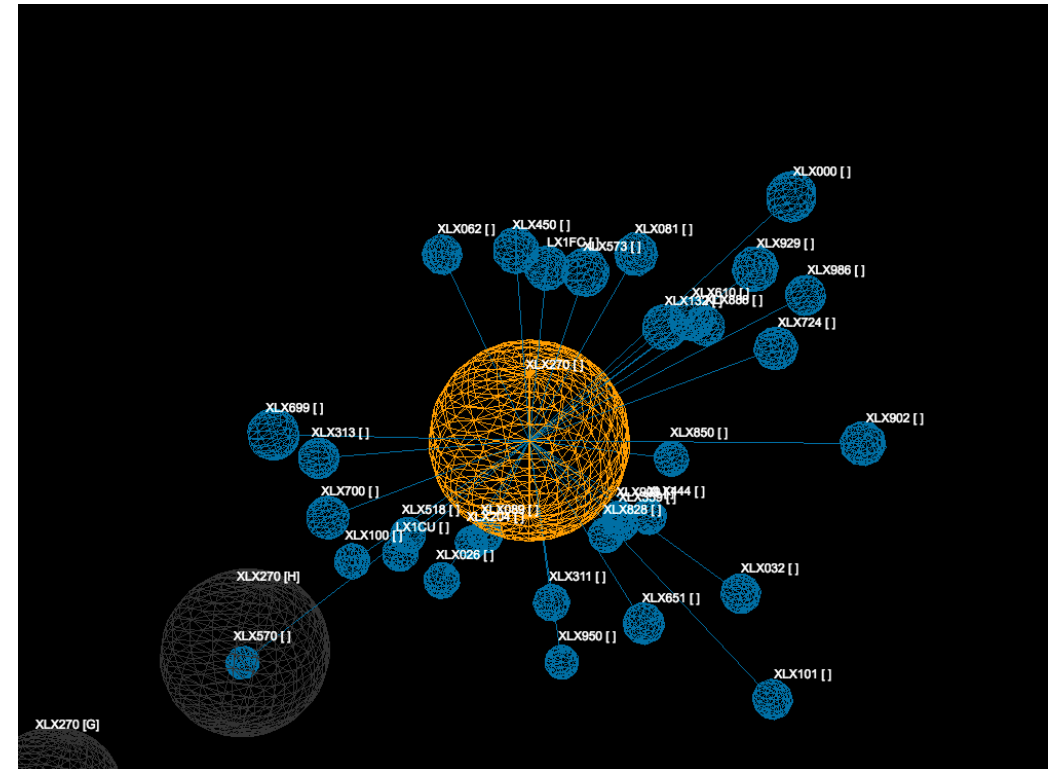
REFxxx reflectors, UR commands e.g. Linking
Reflectors managed by AA4RC

Dextra Scott KI4KLF

XRxxxx open source, run your own! and
published the problems with the original G2.
ircDDB Hans DL5DI with DL1BFF DG8NGN created ircddb
Scott collaborated to get ircddb integrated.
DCSxxx reflectors

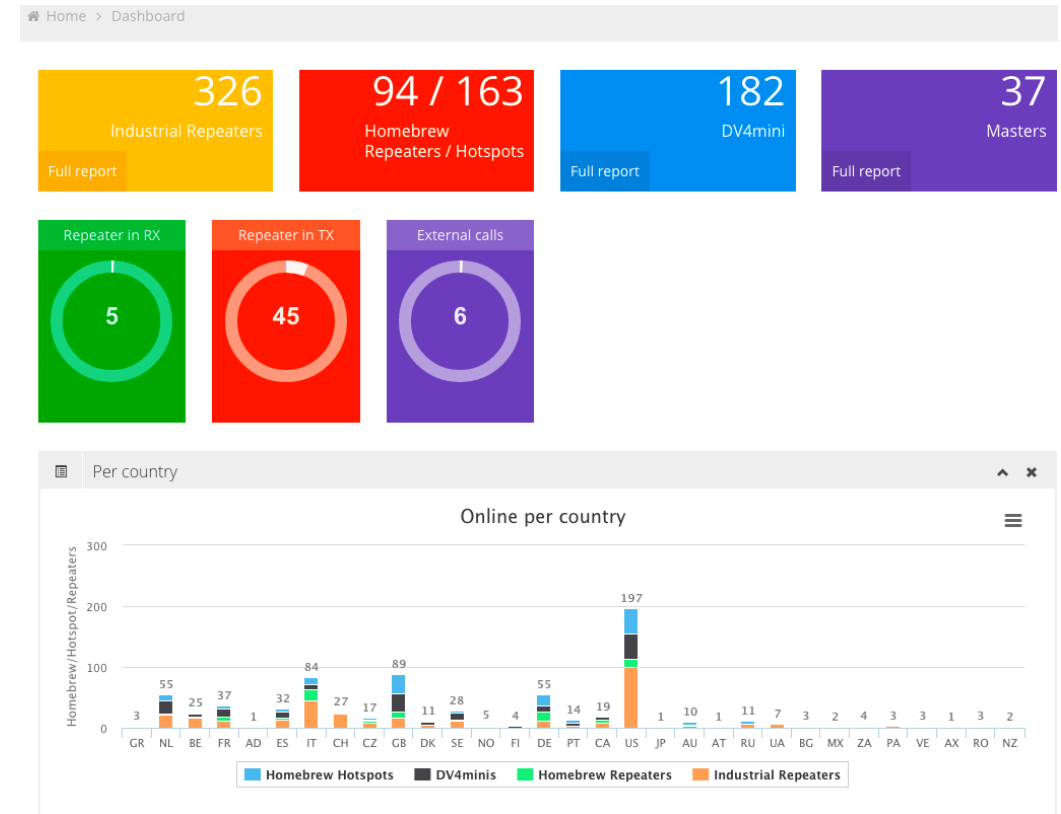
XLX Lux LX1IQ and Jean-Luc LX3JL supports D-Plus,
Dextra, DCS ... high performance internode protocols and
handling [Deliberately GPL and copyleft]

Jonathon G4KLX ircddbgateway and dstarrepeater [GPL
and copyleft]



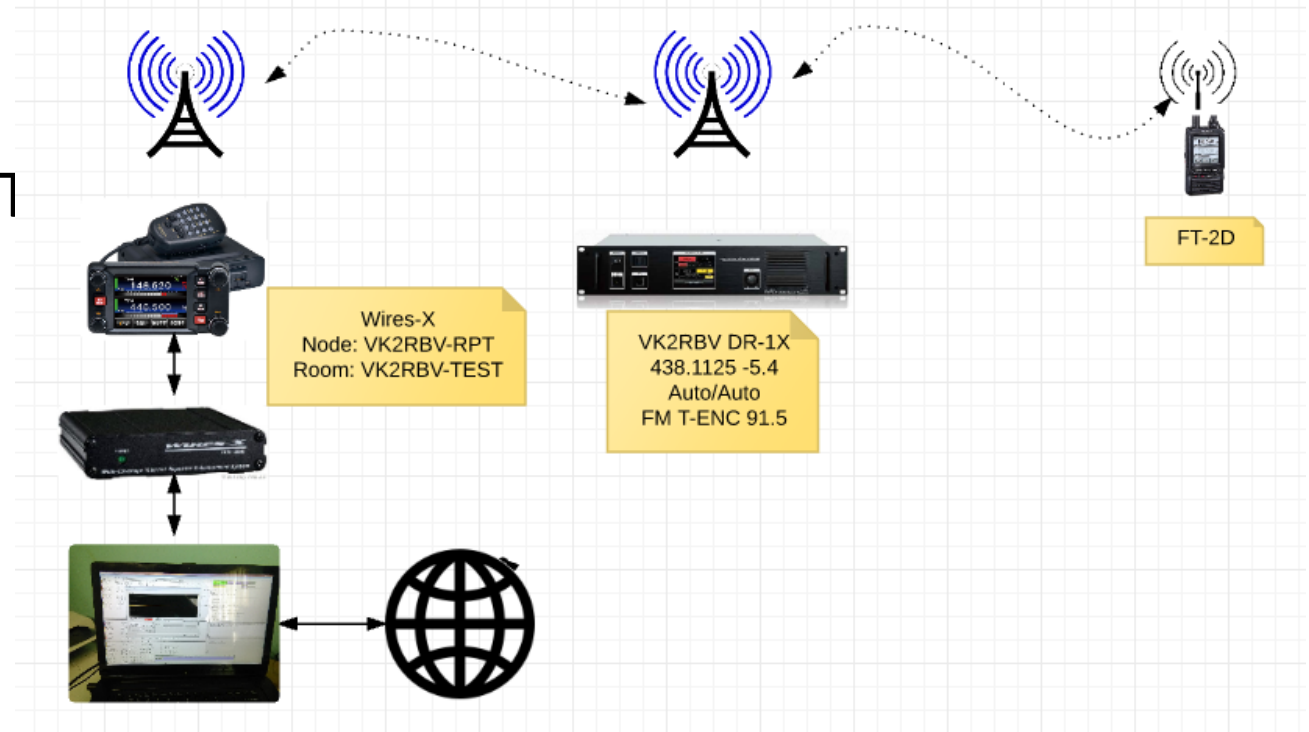
DMR Network and Reflectors

- DMR-MARC (Motorola Amateur Radio Club)
 - **500+** DMR-MARC repeaters in **48** countries with **38305** registered users
- DMR+
 - Support for Hytera and other 3rd party
 - 300+ Mainly Europe
 - DV4Mini's
- BrandMeister
 - 300+ networked repeaters
 - Integrating MMDVM and DV4mini

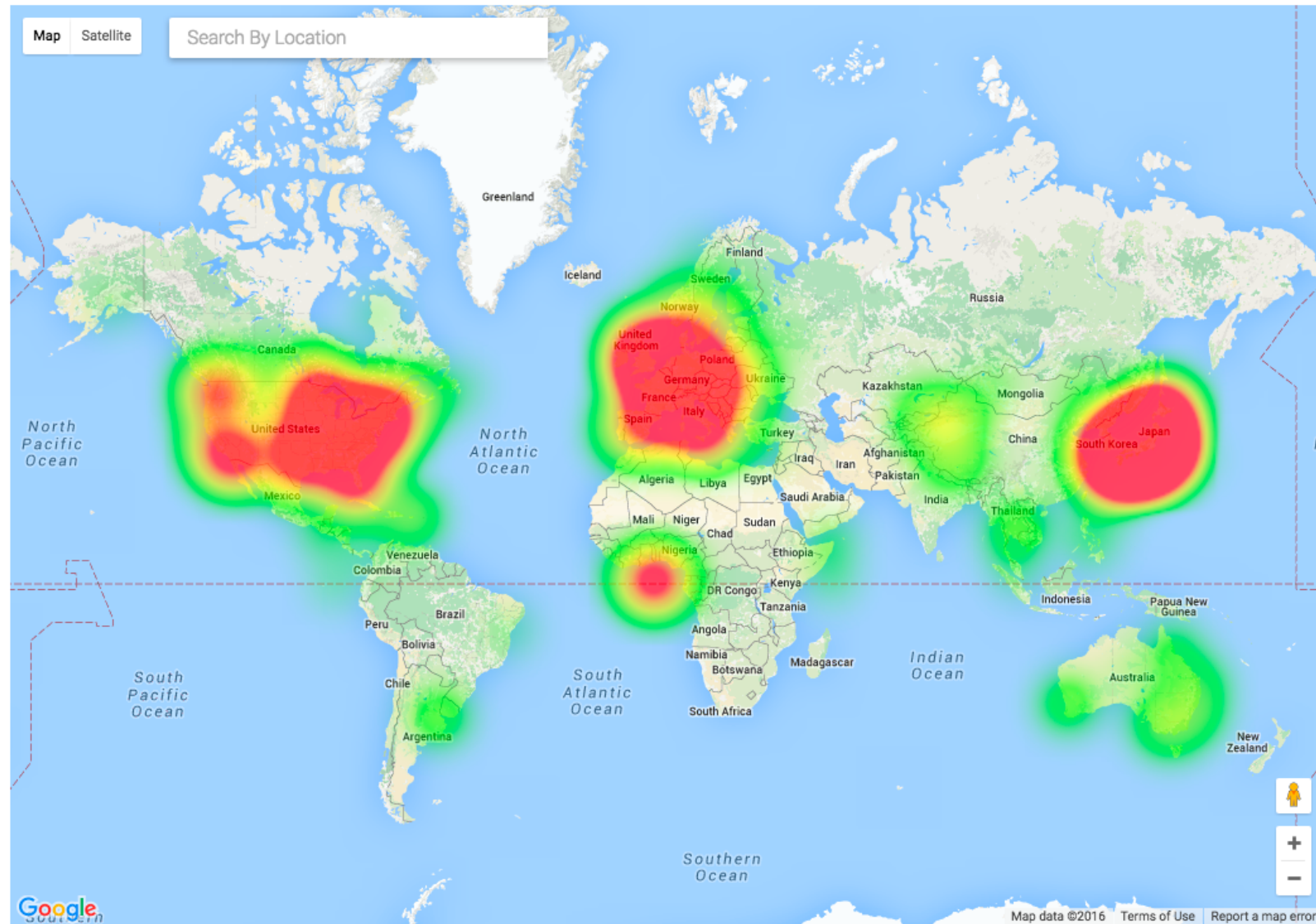


Fusion

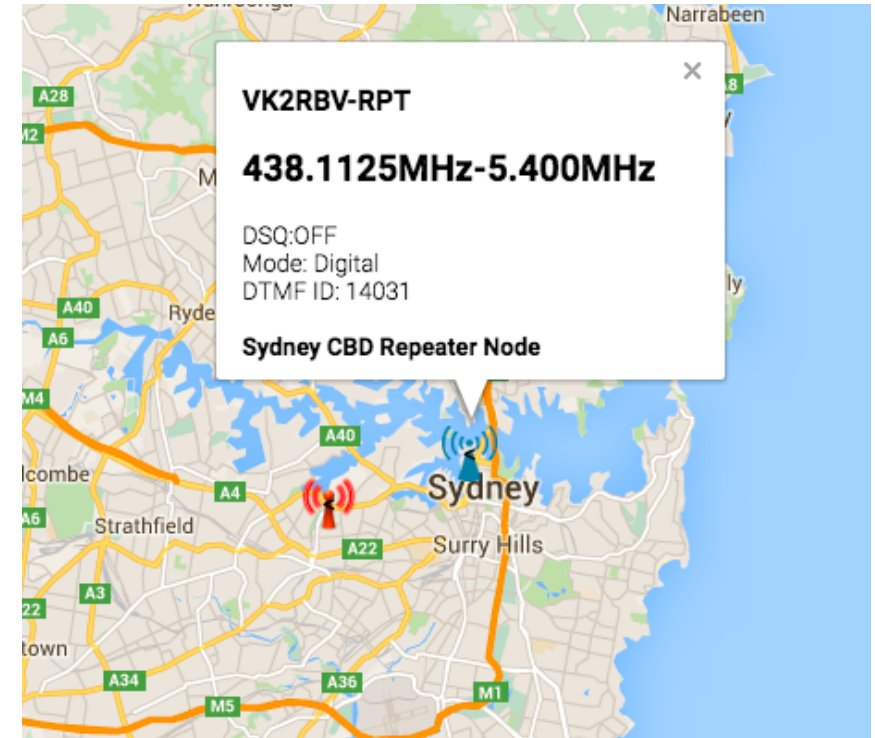
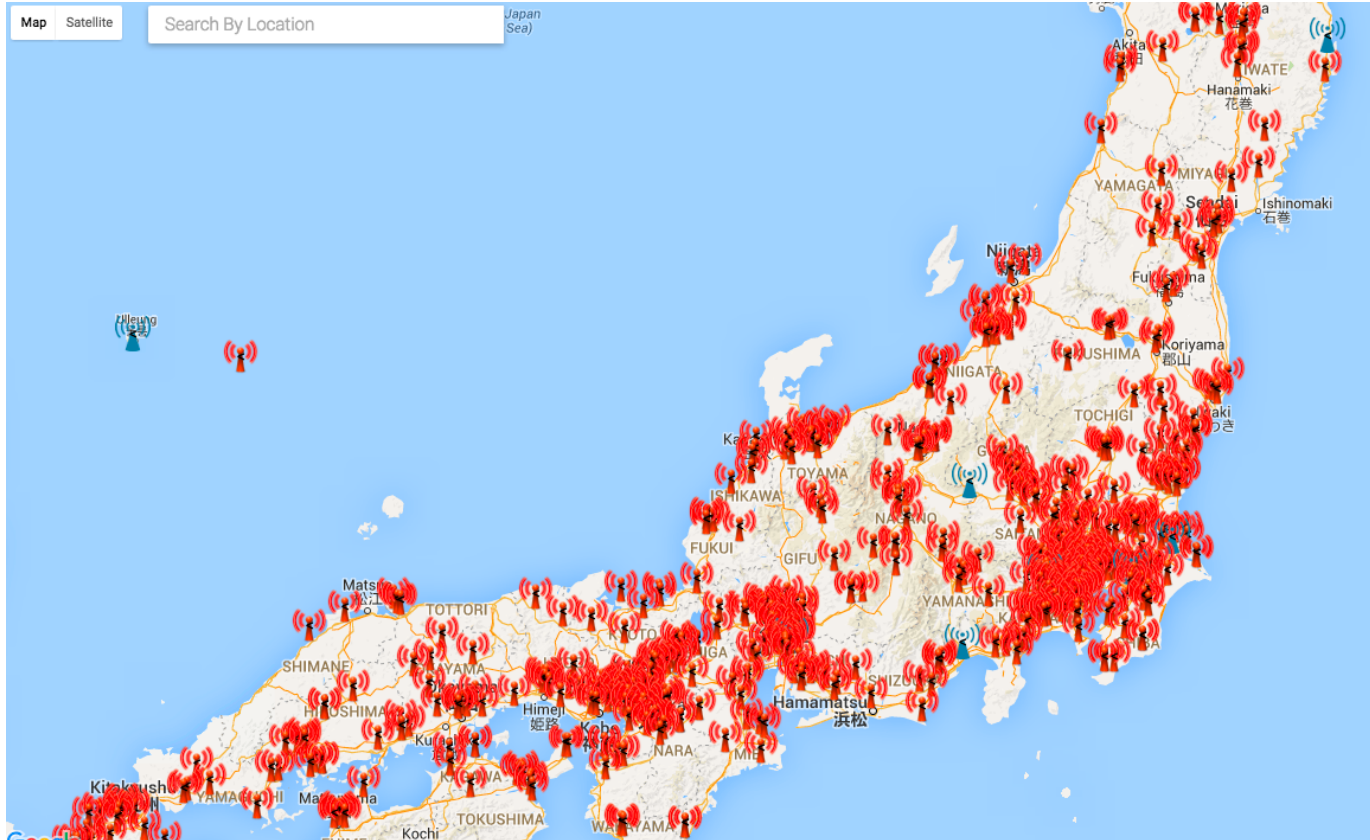
- 700 Digital, 294 Analog (10% repeaters?)
- FCS reflector system from DG1H7 works with DV4mini
- Early Days for the digital side... Network stabilised (not as many crashes and lockups!) in Jan-Feb 2016
- Dedicated Node Radio
- New repeater supports direct connect digital

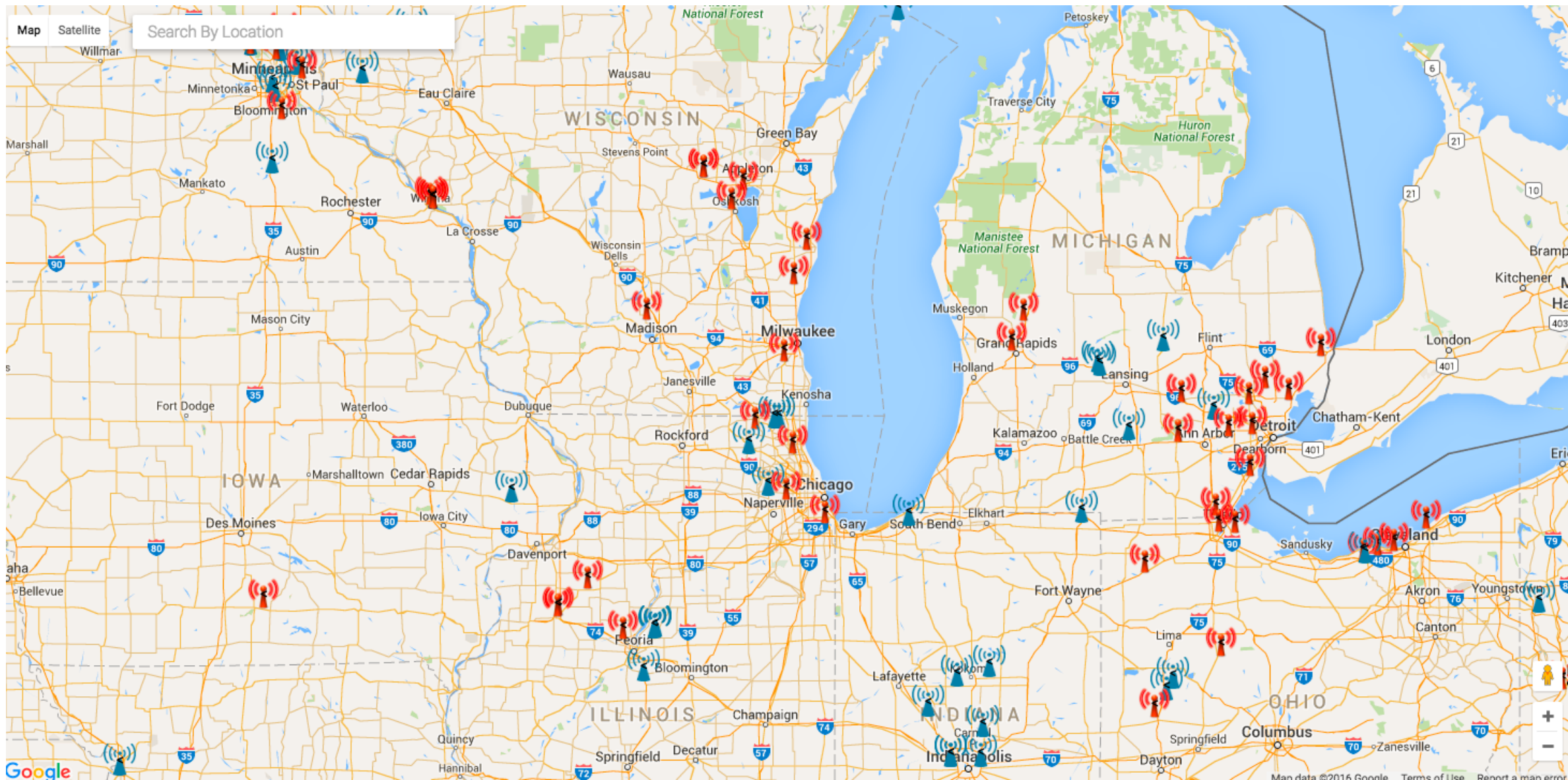


Fusionlive.net



Fusionlive.net





Room ----MNWIS-FUSION(21493) member 29 nodes

Refresh

Close

AI5AI-ND

AI5AI-DON

Send Node : AI5AI-ND (11880) / Mobile : AI5AI-DON

NOBVE-MPLS

WD9HBC-ND

ADOMI/R

K5STAR-RPT

WB9RKD-RPT

NORND-ND

ADOUU-PAUL

KC9TDC-ND

WA7DRE-RPT

WOMDT-RPT

KF7MLE-ND

WOJPJ-RPT

NOXOC-ND

N5LUB-WACO

WA7BFN-RPT

ADOMI-725

KE0EMB-ND

WOUJ-RPT

KC9ONA-RPT

VA7CQ-ND

KE8CQ-ND

NO1AI-RPT

KK6ZHZ-ND

RAYTOWN/R

WB7OEV-RPT

K5KOY-ND

MB6IEI-GW

VK2RBV-RPT

WIRES-X

DTMF ID: 21493

2016/06/25 22:29:56

MNWIS, Field Day OK!

< ----MNWIS-FUSION #21493 >

<http://www.mnwis.com><http://www.hamoperator.com>Fusion net: Monday 1930 central time
#21493

HardCopy

Save

Close

+A.User ID	DTM...	CallSign	City	State	Cou...	Freq(MHz)	SQL	Lat
---K0STP--	11344	K0STP	Gordonsville	Virginia	USA	432.500M...	DSQ:OFF	N:3...
--KYOTO--	19507	JL3ZAR	Kyoto-city	Kyoto	Japan	430.820M...	DCS:172	N:3...
-JE3ZQR-ND	12468	JE3ZQR	Moriyama-city	Shiga	Japan	144.570M...	DSQ:049	N:3...
1ST-RIG-ND	12556	JH8IKV	Sapporo-city	Hokkaido	Japan	430.94MHz	DSQ:005	N:4...
2E0BWF-ND	17833	2E0BWF	Waterthorpe	South Y...	UK	435.525M...	DSQ:OFF	N:5...
4F7EDM-ND	14070	4F7EDM	M...	437.775M...	DSQ:OFF	N:1...

Room ID	DTM...	-Act	Room name	City	State	Cou...	Comr
ALLJA-CQ-ROOM	20510	167	ALL JA CQ ROOM#1	Yamato-city	Kanagawa	Japan	yCQf
---AMERICA-LINK-	21080	065	REPEATER LINKING	Beaumont	Texas	USA	(Anal
ITALY	27003	036	WIRES-X ITALIA	Cassolnovo	Lombardy	Italy	WIRES
0382-ROOM	20382	030	WIRES-X 0382Room	Nagoya-city	Aichi	Japan	WIRES
----MNWIS-FUSION	21493	028	MNWiS, Field Day OK!	Lino Lakes	Minnes...	USA	mainl
TEAM0949-ROOM	20949	024	%œ,î,b,p,q...	Souraku-gun	Kyoto	Japan	,v,%œ,
9158-ROOM	29158	026	9158Ži-î,îf<[f€	Itabashi-ku	Tokyo	Japan	f[[f^j
TSQLO945-ROOM	20945	025	fg[f" fXfPf<f" #D%œ	Koriyama-city	Fukushi...	Japan	WIRES

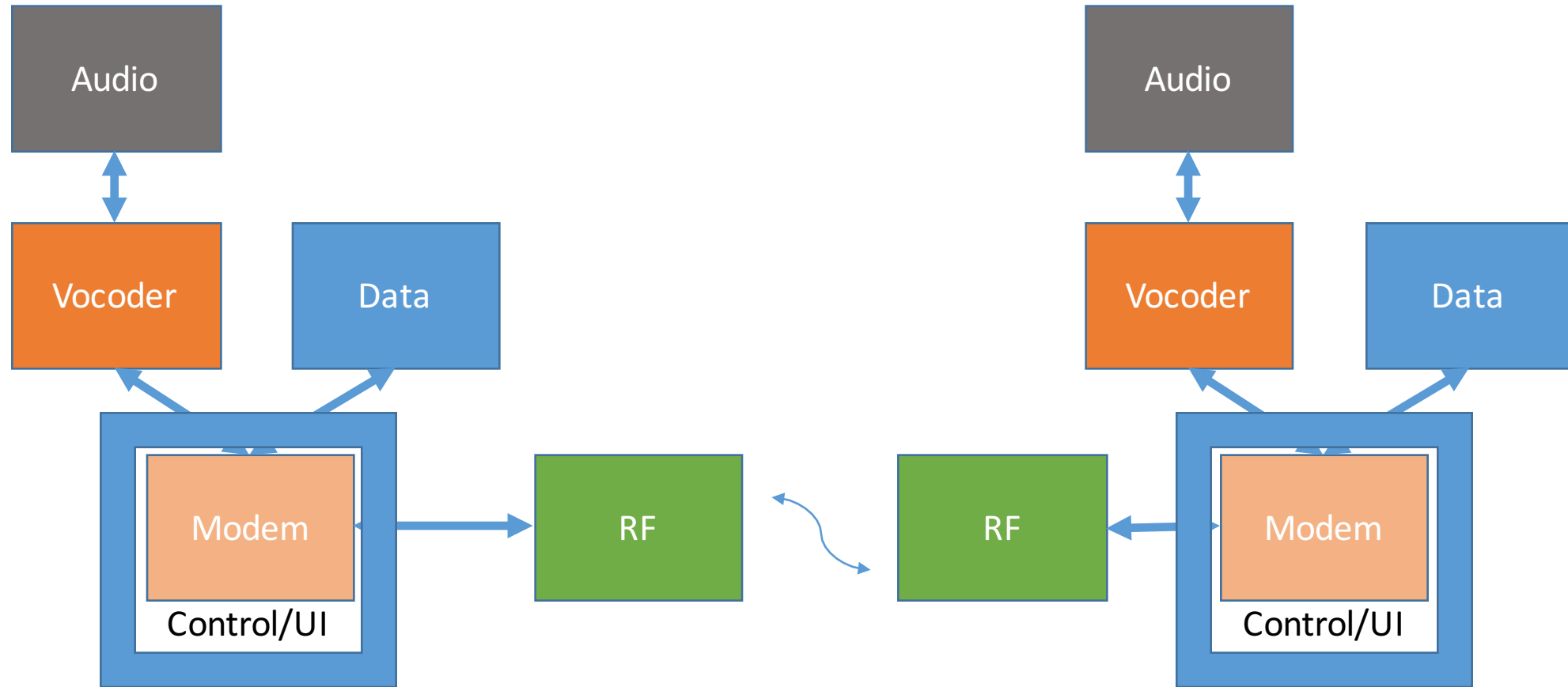
News

GM

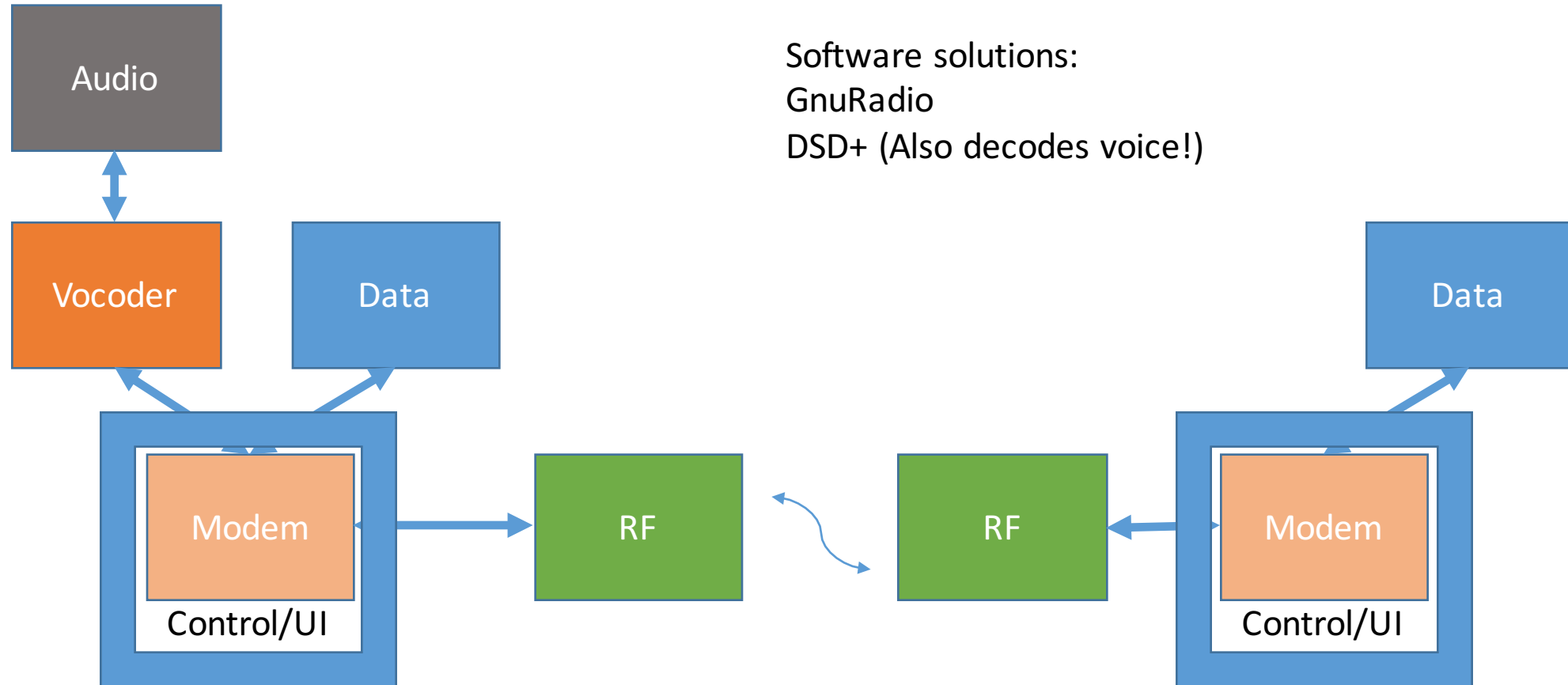
ONLINE

Ready

Basic pieces of DV - RF Link



Basic pieces of DV - RF Link (Data Only)



Basic pieces of DV - Data Link (Repeater Gateway, Hotspot)

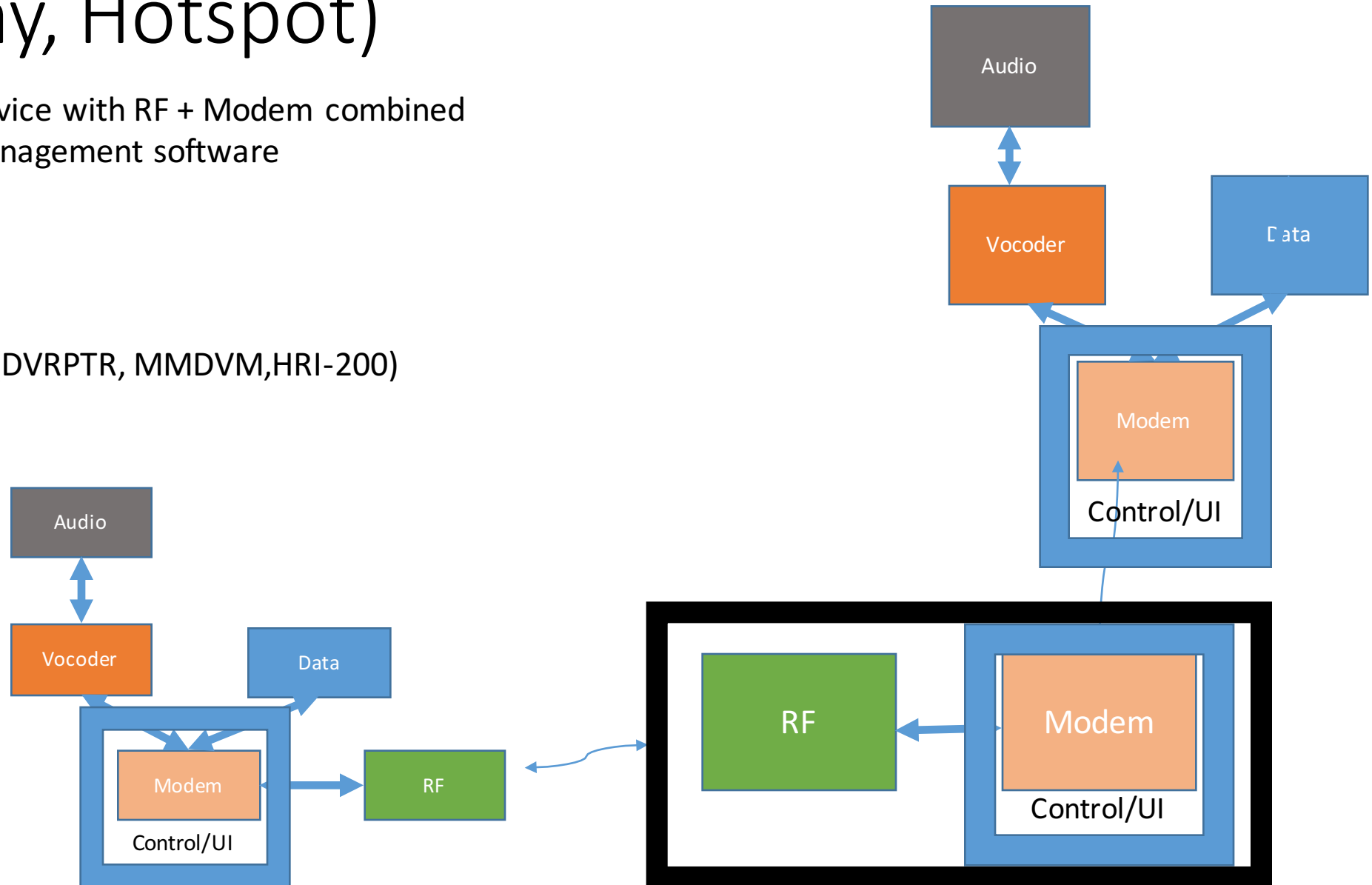
Hardware device with RF + Modem combined
with some management software

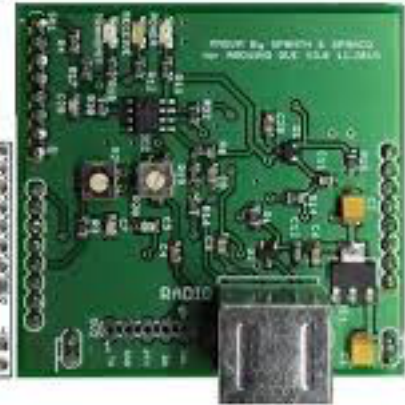
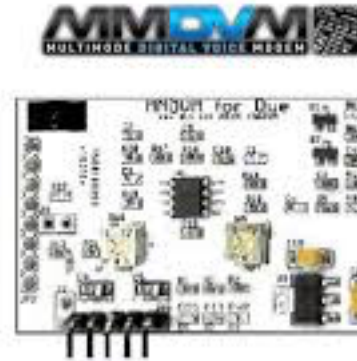
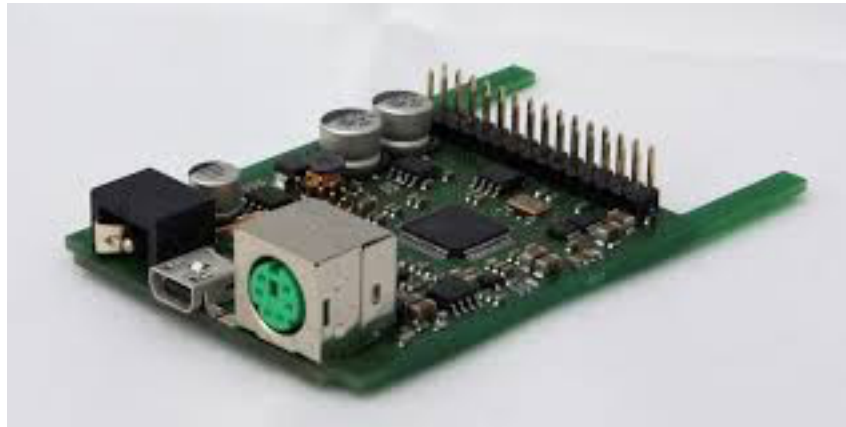
DVAP

DV4mini

DVMega

Modem Only (DVRPTR, MMDVM, HRI-200)





Basic pieces of DV - Dongle Solutions

Hardware device with AMBE chip and modem
combined with some user software

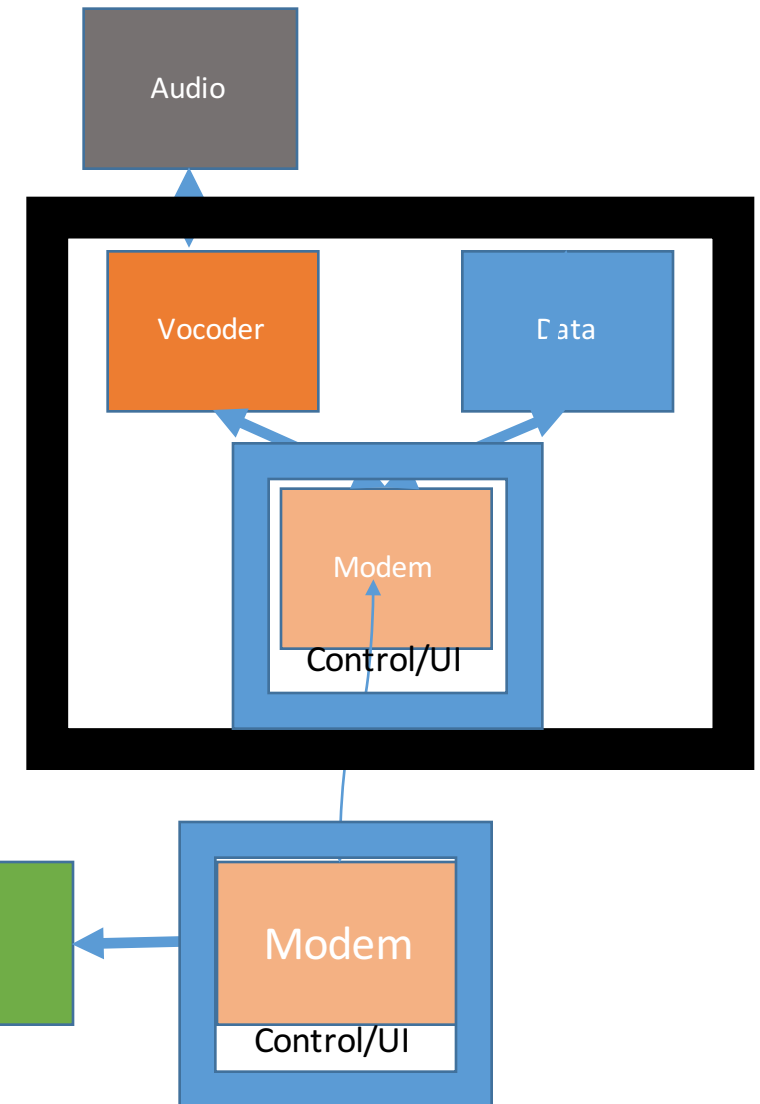
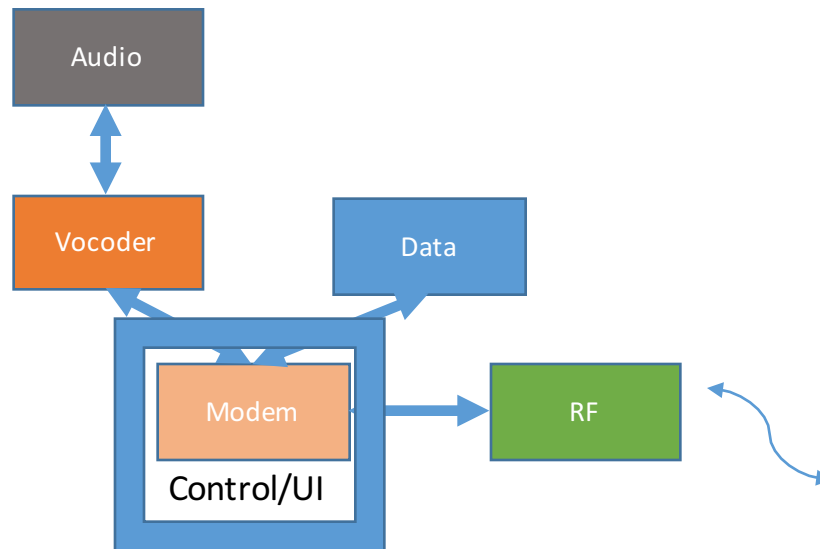
DV Dongle

Thumb DV

Includes soundcard(Audio)

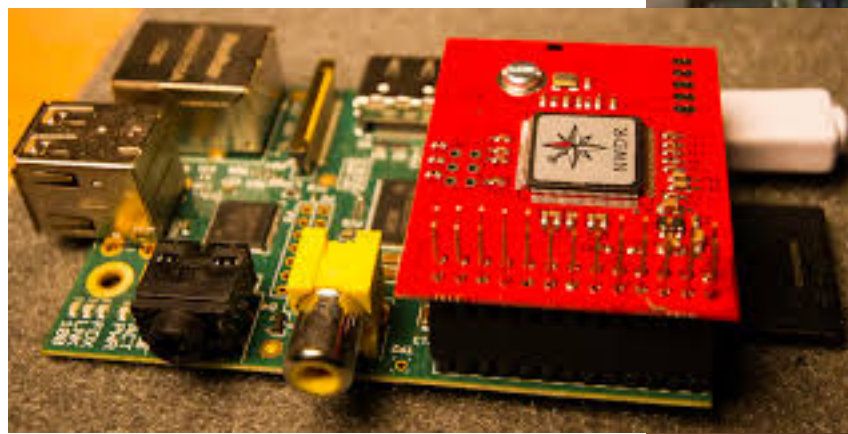
DVRPTR-AMBE

SM1000 (Codec2)





Coming Soon since 2012



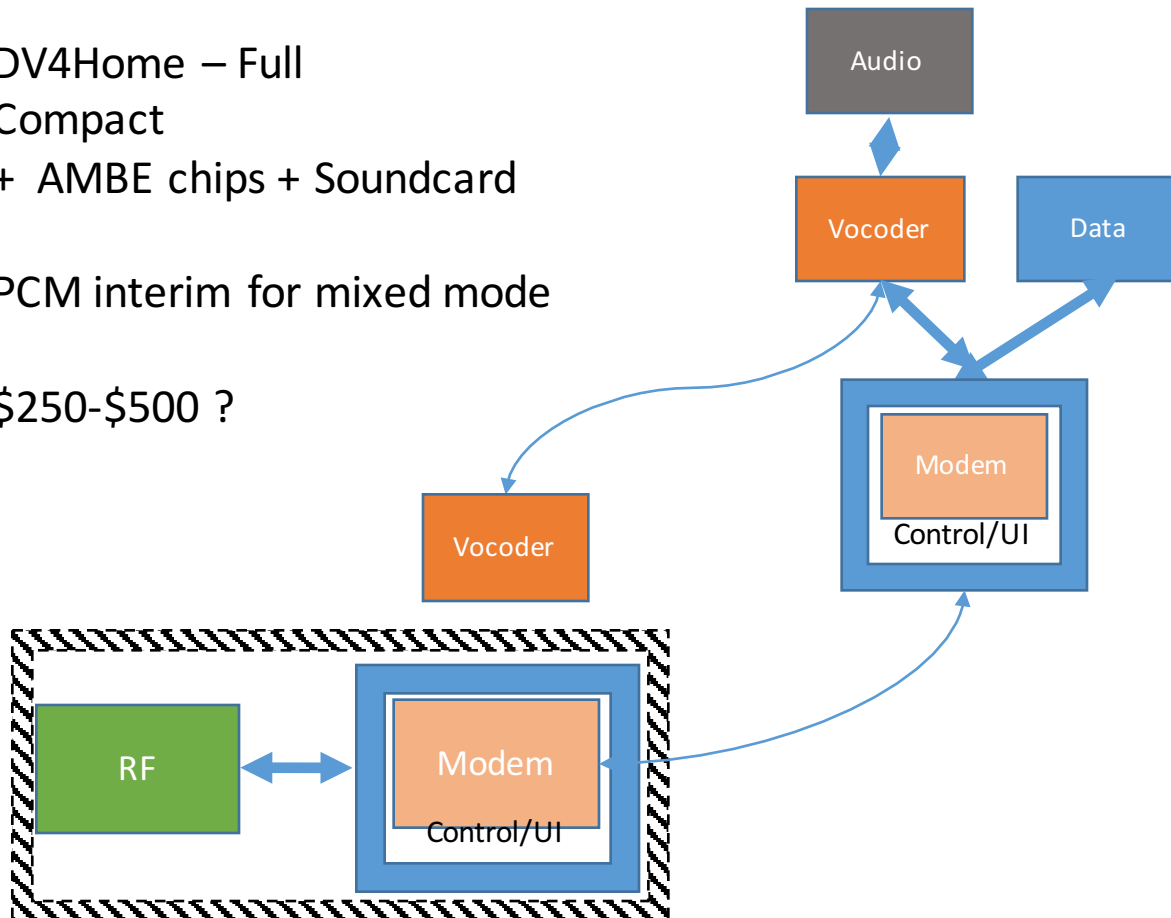
“Coming Soon...?????.....”

DV4Home –compact
Screen + SBC + Plug in DV4mini

DV4Home – Full
Compact
+ AMBE chips + Soundcard

PCM interim for mixed mode

\$250-\$500 ?



“Coming Soon...?????.....”

DV4Mobile

Tri Tri Band SDR

2 x 20W transmitter[50W transistors]

(Future HF AddOn?)

Screen + SBC (HDMI,BT,Wifi,Eth,USB)

LTE card+Sim (Over the Air programming)

+ Use the LTE as gateway(DVAP etc)

[Virtual SIM LTE]

All Modes

(FM,C4FM,NXDN,P25,DMR,dPMR,Dstar...)

PCM interim for mixed mode

Cross Band – Cross Mode!

Connect 2 together - repeater stack....

\$900-1200???



“Coming Soon...?????.....”

Aimed at the ARES/RACES market

KENWOOD

TENTATIVE

Welcome to a new world

APRS
&
DIGITAL



The new,
brilliantly evolved tribander

144 / 220 / 430 MHz TRIBANDER



Using packet-transfer communication to exchange
real-time GPS positional information and messages
for APRS-compliance

Compliant with voice/digital mode
D-STAR digital amateur radio networks

[Main Features]

- Built-in high-performance GPS unit
- Transflective color TFT Display
- Weatherproof toughness meeting IP54/55 standards
- Wide-band and multi-mode reception
- Equipped with IF filter for comfortable reception (SSB/CW)
- High-performance DSP-based voice processing
- Compliant with Bluetooth, microSD & Micro-USB

* APRS® (The Automatic Packet Reporting System) is a registered trademark of W4AAR (Bob Bruninga) in the USA. * D-STAR is a digital radio protocol developed by JARL (Japan Amateur Radio League). * Actual product colors may differ from photograph due to photography or printing conditions.

JVCKENWOOD USA Corporation

Communications Sector Headquarters

3970 Johns Creek Court, Suite 100, Suwanee, GA 30024-1265



Links <http://vk2bv.org/home/faq>

- Dstar
 - dstarinfo.com
- Fusion
 - hamoperator.com
 - fusionlive.net
- xreflector.net
- DMR
 - vkdmr.info
 - vkdmr.net
 - brandmeister.network
- Codec 2
 - freedv.org
 - rowetel.com
- Tapr.org
 - In particular DCC conferences
- Yahoo Groups
 - YaesuSystemFusion
 - VK-DMR
 - ircddbgateway
 - TYT-TYTERA
 - xlx-d-star
 - mmdvm